

## Quiz 5 key

① B, C

(A:  $s \rightarrow l + g$  more entropy in reactants) ...

② B:  $\Delta S = (S_{\text{CO}_2(g)} + 2S_{\text{H}_2\text{O}(g)}) - (S_{\text{CH}_4(g)} + 2S_{\text{O}_2(g)})$

$$\Delta S = (213.6 + 2(188.7)) - (188 + 2(205.0)) = -75 \text{ J/molK}$$

C:  $\Delta S = (S_{\text{MgCl}_2(s)}) - (S_{\text{Mg}(s)} + S_{\text{Cl}_2(g)})$

$$\Delta S = 89.6 - (32.7 + 223.0) = -166.1 \text{ J/molK}$$

③  $\Delta G = G_{\text{MgCl}_2(s)} - (G_{\text{Mg}(s)} + G_{\text{Cl}_2(g)})$

$$\Delta G = -591.8 - (0 + 0) = -591.8 \text{ kJ/mol}$$

④  $\Delta G = \Delta H - T\Delta S = 0 \quad T = -\frac{\Delta H}{\Delta S}$

$$\Delta H = -365.4 - (33.2 + 2(-241.8)) = 84.8 \text{ kJ/mol}$$

$$\Delta S = 151.1 - (240.0 + 2(188.7)) = -466.3 \text{ J/molK} = -0.4663 \text{ kJ/molK}$$

$$T = \frac{-84.8 \text{ kJ/mol}}{-0.4663 \text{ kJ/molK}} = 182 \text{ K}$$

⑤  $\Delta G = -RT \ln K$

$$\Delta G = -\left(8.314 \frac{\text{J}}{\text{molK}} \times \frac{\text{kJ}}{1000\text{J}}\right) (298\text{K}) (\ln 3.0 \times 10^{-4})$$

$$\Delta G = -20.1 \text{ kJ/mol}$$